

Response  
Application No. 10/581,916  
Attorney Docket No. 062520

**REMARKS**

Claims 1-5 are pending in the present application. By this Amendment, claims 1 and 3 have been amended and claim 4 has been cancelled. No new matter has been added. It is respectfully submitted that this amendment is fully responsive to the outstanding Office Action dated June 19, 2007.

**Drawings**

The Examiner stated that Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated.

The Examiner provides no support for this objection. In the specification, Figure 1 is clearly explained in the section entitled, "Best Mode for Carrying Out the Invention" and is not intended to represent prior art.

In addition, Figure 1 is specifically referred to in the application in the section entitled, "Best Mode for Carrying out the Invention." Figure 1 is used to describe "a principle of a DC-DC converter according to the present invention" (see paragraphs 0029, and 0030-0033 of application). Particularly, Figure 1 is used to describe the overall concept of the invention. For example, the driving means 4 of Figure 1 correlates to the control circuit 4 of Figure 2. Driving means is merely a more general term for a control circuit. Therefore, Figure 1 is not presenting prior art, but a more general embodiment of the invention.

Response  
Application No. 10/581,916  
Attorney Docket No. 062520

Applicants argue that Figure 1 is not prior art for the reasons stated above. Also, Applicants submit that the Examiner is required to provide support for the argument that Figure 1 is prior art. As no support was provided in the Office Action, the objection of the Examiner is improper.

**Title:**

The title of the invention stands objected to as being not descriptive. However, it is respectfully submitted that the title has been amended in the manner suggested by the Examiner. Accordingly, withdrawal of this rejection is respectfully requested.

**Claim Rejections - 35 U.S.C. §102**

Claims 1-2 are rejected under 35 U.S.C. §102(b) as being anticipated by *Scheel* (US 6,351,401). This rejection is respectfully traversed.

**Independent Claim 1**

Independent claim 1 calls for a DC-DC converter that includes: a transformer, a switching means, an LC resonant circuit, and a resonant current detecting means. The transformer has primary and secondary side terminals related by a voltage converting ratio. The switching means is located on the primary side of the transformer. The LC resonant circuit includes a resonating reactor (L) in series with the primary side of the transformer, and a resonant capacitor (C). The driving means turns the switching means on and off. The resonant circuit detecting means

**Response**

Application No. 10/581,916  
Attorney Docket No. 062520

detects the resonant current from the LC resonant circuit and feeds that resonant current to the driving means. And finally, the driving means drives the switching means so that the on-state currents of each pair of switches are about equal.

The Examiner argues that all of the elements of independent claim 1 are taught in the reference. *Scheel* discloses a transformer with primary and secondary terminals (see Fig. 1, 9). All transformers have primary and secondary winding ratios related by a voltage conversion ( $N_s/N_p$ ). In addition, the switches in *Scheel* are located on the primary side of the transformer (see Fig. 1, 3 and 5, 4 and 6) as they are in the application (see Fig. 1, 2-1 and 2-2). The driving means of *Scheel* also controls the switches (see Fig. 1, 8 and a, b, c, d). *Scheel* also discloses a resonant circuit detecting means (see Fig. 1, 12) connected to the driving means.

Applicants do not agree with the Examiner's analysis of the "correcting" feature of claim 1 regarding the switching means. Claim 1 recites, "said driving means drives said pair of switching means by *correcting their on-state lapses of time so that their on-state resonant currents may be nearly equal to each other.*" In *Scheel*, the pulse-width modulation is performed for the purpose of producing a particular output voltage. The Examiner cites Figure 3, particularly the resonant current waveform. The figure does not show any correction or adjustment of the resonant current value.

In contrast, for example, paragraph 0032 of the application clearly points out the effort to correct the resonant current values for each set of switches by adjusting the on/off states of the

Response  
Application No. 10/581,916  
Attorney Docket No. 062520

pairs of switching means (see Figure 5 for an illustration). Therefore, Applicants argue that *Scheel* does not disclose the “correcting” feature of claim 1.

Applicants also do not agree with the Examiner’s analysis of the LC resonance circuit element of claim 1. In the application, the LC resonance circuit is located on the secondary side of the transformer (see Fig. 1, 3). The reference *Scheel* discloses the LC resonance circuit on the primary side of the transformer (see Fig. 1, L, C).

In light of the above, Applicants submit that the “correcting” feature of claim 1 is not taught by the reference. Therefore, claim 1 is not anticipated by *Scheel*.

#### Dependent Claim 2

Claim 2 is directly dependent on independent claim 1. Therefore, claim 2 is not anticipated by *Scheel* for at least the reasons set forth above.

#### Claim Rejections - 35 U.S.C. §103

Claims 3-5 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Scheel* (US 6,351,401) in view of *Sashida* (US 5,189,603) and *Hikari* (JP 07039152). This rejection is respectfully traversed.

#### Independent Claim 3

Independent claim 3 calls for, among other elements, correcting the on-state lapses of the switching means so that their on-state resonant currents may be nearly equal to each other. The

Response  
Application No. 10/581,916  
Attorney Docket No. 062520

equaling of resonant currents is achieved by using the detected output of the resonant circuit detecting means.

The Examiner uses the same argument regarding *Scheel* as detailed above. However, the Examiner acknowledges that *Scheel* does not disclose a passive output rectifier, nor does the reference disclose switching means interposed between the high-voltage side terminals and the high-voltage side winding.

Applicants disagree with the Examiner's interpretation of *Scheel* with regards to the "correcting" feature of claim 3. Claim 3 recites, "said driving means drives said low-voltage side pair of switching mans or said high-voltage side pair of switching means by *correcting their on-state lapses of time so that their on-state resonant currents may be nearly equal to each other.*" The figure that the Examiner cited in the Office Action in the reference does not show any "correcting" of the resonant current. Figure 3 only shows the pulse-width modulation and current waveform, but does not show an effort to correct the resonance current values from one switching cycle to another. In addition, the disclosure of *Scheel* particularly details the use of pulse-width modulation in an effort to control the output voltages of the converter (see Abstract). However, the present application is focused on producing the same current for each pair of switching means (see paragraph 0032 of the application). Therefore, Applicants argue that the "correcting" feature of claim 3 is not disclosed by *Scheel*.

Response  
Application No. 10/581,916  
Attorney Docket No. 062520

In addition, as noted above, *Scheel* discloses that the LC resonance circuit is located on the primary side of the transformer, whereas in claim 3 the LC resonant-circuit is interposed between said high-voltage side winding and said high-voltage side pair of switching means.

In light of the above, Applicants argue that *Scheel* does not teach all of the elements of claim 3. Therefore, claim 3 is not unpatentable over of *Scheel* and in view of *Sashida* and *Hikari*.

Dependent Claims 4 and 5

Claims 4 and 5 are directly dependent on independent claim 3. Therefore, claims 4 and 5 are not unpatentable over *Scheel* in view of *Sashida* and *Hikari* for the reasons set forth above.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

Response  
Application No. 10/581,916  
Attorney Docket No. 062520

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

**WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP**



Thomas E. Brown  
Attorney for Applicants  
Registration No. 44,450  
Telephone: (202) 822-1100  
Facsimile: (202) 822-1111

TEB/nrp